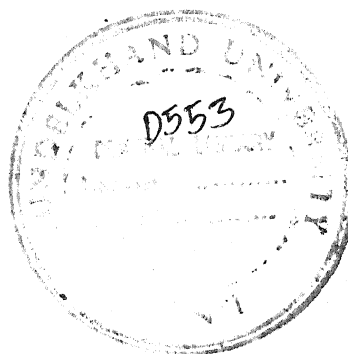


**COMPARATIVE STUDY BETWEEN
HYSTERO SALPINGOGRAPHY
AND
ULTRASONOGRAPHY FOR TUBAL
PATENCY IN PATIENTS OF STERILITY**

**THESIS
FOR
(MASTER OF SURGERY)
(OBSTETRICS & GYNAECOLOGY)**

*Approved
Dinesh Thakur
1.1.93*



**BUNDELKHAND UNIVERSITY
JHANSI (U. P.)**

Dedicated to

MY PARENTS

To whom I owe everything

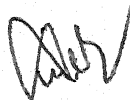
in my life

C E R T I F I C A T E

This is to certify that the work entitled "COMPARATIVE STUDY BETWEEN HYSTEROSALPINGOGRAPHY AND ULTRASONOGRAPHY FOR TUBAL PATENCY IN PATIENTS OF STERILITY" which is being submitted as a thesis for M.S. (Obstetrics and Gynaecology) examination, 1993 of Bundelkhand University, Jhansi by ALKA YADAV has been carried out under my direct supervision and guidance in the Department of Obstetrics and Gynaecology, M.L.B. Medical College, Jhansi. The observations recorded in this thesis have been periodically checked by me.

She has fulfilled necessary requirements of stay in the Department as per university regulations.

Dated: 30th Sept '92.


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(SUPERVISOR)

C E R T I F I C A T E

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It is due to the guidance of all those aforementioned that I could work on this novel and highly esoteric subject and overcome the recondite problems involved therein; but my husband Dr. O.P. Yadav, and my treasured friends deserve a special vote of thanks, for they have not only shared my joyous moments, but also egged me on in frustrating moments and elevated me during inevitable moments of depression and fatigue.

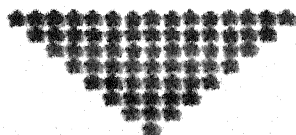
Besides all these, it has been due to the abiding faith of my younger brother, Pushpendra and affection of my family members which has always prompted me to put in the best of my efforts in my work.

Alkayadav

(ALKA YADAV)

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I N T R O D U C T I O N

INTRODUCTION

For a couple to attempt to reproduce has been one of the basic aims of society throughout ages. The majority succeed under the most adverse conditions, rendering the infertile minority as subjects for evaluation. Infertility is the inability to achieve pregnancy within a stipulated period of time usually one year, without contraception. According to Jaffcoates Principles of Gynaecology (1987) Infertility (sterility) 'is an absolute state of inability to conceive; 'Subfertility' is a relative state of lowered capacity to conceive and is same as secondary infertility.

Primary infertility is the state where no conception has occurred earlier whereas secondary sterility is the condition where conception has failed to occur after a previous pregnancy.

The incidence of infertility, both primary and secondary, varies from 2-10 percent of all married couples. (Post graduate Obstetrics and Gynaecology by M.K. Krishna Menon, P.K. Devi, K. Bhasker Rao. 4th Edition).

Infertility has become one of the most sought after medical problems. Several factors contribute to this increased demand for infertility investigation.

They include -

1. Increased number of women in the reproductive age group.
2. A trend towards later age of child bearing which increases the span of years of exposure to infections or toxins as well as age specific reductions in fertility.
3. A greater public awareness of the availability and scope of newer lines of treatment.
4. The availability of new technology and drugs for the treatment of previously hopeless causes of infertility.

Evaluation of an infertile couple is done concurrently, even though the cause may be quite obvious, since many couples have more than one cause which can be dealt with simultaneously.

Tubal dysfunction continues to be one of the major causes of infertility in a female. Pelvic infection results in a spectrum of diseases ranging from the completely unaffected pelvic organs to total destruction of tubal integrity. These factors interfere with fertility by affecting the sperm transport, capacitation, ovum pick-up, ovum transport, fertilisation and embryo transport.

Hence, there is a need for accurate assessment of tubal dysfunction. Various methods have been employed since time immemorial to test various defects of the tubes. Patency is one of the most important tubal factors contributing to

fertility. Proper motility, ciliary movements, biological environment being the most essential tubal factors.

Tubal insufflation, chromotubation and hysterosalpingography are important investigative procedures to test the patency of the tubes in the patients seeking investigations for infertility. Amongst which hysterosalpingography and chromotubation can locate the site of tubal block in patients of sterility. Besides this HSG also gives information about the lining of the tube i.e. tubal mucosa.

Human nature has always been not to be satisfied with one research and is always trying to find newer and better techniques to satisfy the urge of advancement in every field. Secondly, all these methods are invasive in nature and so they are associated with their own complications apart from the agony which they inflict on the female. Hence there had been a constant search for evaluating the tubal function by means of non-invasive procedures like ultrasonography. Ultrasonography, because it is safe and non-invasive can be used to obtain morphological and functional information about the tubes, at the same time avoiding the risk of complications due to an invasive procedure like hysterosalpingography.

A I M S & O B J E C T I V E S

AIMS AND OBJECTIVES

Keeping all the factors in mind, present study was thus undertaken with following aims and objectives :-

1. To evaluate the causes of infertility in sterility patients, in females, of fertile age group by hysterosalpingography and ultrasonography.
 2. Use of a non-invasive technique of ultrasonography for evaluating the patency of fallopian tube(s) in patients of infertility.
 3. Comparison between the results of hysterosalpingography and ultrasonography reports about the patency of fallopian tube(s) in patients of infertility.
-

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Infertility has become most sought after medical problems, now a days. The availability and awareness of the newer techniques and areas of investigation have been a major foothold in this area.

There are six major factors of importance in fertilisation and implantation of an ovum (according to Novak's Textbook of Gynaecology.)

1. Ovulatory factors : Involving the physical act of ovulation and release of mature oocyte.
2. Male factor : Involving adequate production of normal sperms.
3. Mucus or cervical factor : Involving the presence of adequate cervical mucus which can act as a transport medium and repository for sperms.
4. Endometrial or uterine factor : Involving the preparation of the endometrial implantation site that is dependent on ovarian endocrine function, and uterine and organ normality and response.
5. Tubal factor : Involving patency of tubes allowing transport of sperm and oocyte.

6. Peritoneal factor : Involving the absence of any physical or mechanical barrier to fertility within the peritoneal cavity.

For a successful pregnancy all these factors must function properly. Defect in any single factor leads to infertility. For evaluating infertility, both partners have to be considered simultaneously. Once the male factor is found to be normal. The female factors have to be evaluated.

The tests of tubal function are diagnostic as well therapeutic, in that they tend to overcome minor obstructions and fimbrial agglutination. The historical evaluation of these tests have depended upon the indication based improvement of the techniques and media used and also the promotion of safety and patient acceptability of the test.

The first method was of tubal insufflation using carbon dioxide described by Rubin (1920). Though convenient to perform and uncomplicated, it is technically unsatisfactory and gives misleading information.

In 1895, Roentgen discovered a new kind of ray (X-ray) which when used at different wavelengths could be used to project the image of the body tissues on radiographic plate.

Namehow (1909) for the first time obtained Roentgenogram of uterine cavity by injecting Lugol's iodine solution.

This was the evaluation of the technique of 'HYSTEROGALPINGOGRAPHY'. It is a technique of the radiographic demonstration of uterine cavity, fallopian tubes and the peritoneal spillage after the transcervical injection of a contrast media.

Rindfleisch in 1910 used Bismuth emulsion to delineate uterine cavity radiographically and is thus credited with first observation of the uterine cavity in humans. Since then several attempts have been made to use various contrast media. Dartigues and Dimer (1913), William and Cary (1914) and Rubin (1914) used 10% collargel solution. But it was reported to be non-absorbable and also caused peritoneal irritation so was discarded.

Polak (1921) used Thorium for hysterosalpingography. Sodium bromide was used by Kennedy in 1923, emulsions of Barium sulfate and Bismuth were tried by Williams and Reynolds in 1925. As all of these were found unsatisfactory, they were discarded.

Sicard and Forestier (1922) used Lipoidol (40% iodine in poppy seed oil)- an oil soluble contrast media for exploration of uterine cavity and fallopian tubes.

Forsdike in 1925 also used Lipoidal for this purpose. The results were better with fewer complications such as peritoneal irritation. These complications were reported by Rubin and Bendick in 1926 and 1928 respectively.

Morbid reactions following the injection of Iodopin or Lipoidal were reported by Odenthal (1927), Dovery (1927), Hoffman (1928) and Brun and Cortesi (1929). Reis and Lash (1929) emphasized that foreign body effect and encysted masses were produced by Lipoidal.

Neustadter (1913) was the first to advocate the use of water soluble contrast media. Diodrast (1939) was the first such medium used which had inadequate viscosity. Gradually, several such media came into use.

Pyelosil (1946), Hydrobrine '60', Medopaque 'H' (1953), Viscorayopaque (1945), Skiodan, Endograffin, Urograffin 60%, Biligrafin 50%, Diagonal 50% and Sinograffin were used. Inadequate supply of Diagonal, which had showed good results, lead to the discovery of Meglumine Iothalamata 60% (CONRAY 280).

Gajszago (1931) reported uterovenous and uterolymphatic extravasation after hysterosalpingography.

Green Armytage (1943) is credited with the description of the technique for hysterosalpingography.

Murles et al (1946) found hypoplastic uterus as the only positive finding in many infertile women on hysterosalpingography.

Ko-chisun (1948) observed 6 cases out of 138 hysterosalpingogram on infertile women, who showed radio-opaque shadows in the pelvic scout film of 4 cases and other two had fibrocalcineous adhesions present at laparotomy. No peritoneal spillage was seen.

Sun (1949) studied 138 cases of infertility having either unilateral or bilateral tubal blocks and found 6 cases had tubercular salpingitis.

Rutherford et al (1949) studied 43 sterile women by hysterosalpingography and found 27 patients (62.8%) of primary sterility and 16 cases (37.2%) of secondary sterility.

Brown Jennings and Bradbury (1949) observed that oily substances produced a transient peritoneal irritation. Persistent oil in the pelvis frequently produced oil retention cyst and granulomas. Patients who have apparently partially occluded tubes may suffer complete closure as a result of this chronic inflammatory change in the tube induced by persistence of iodized oil.

Drukman and Rozin (1951) studied the phenomenon of intravasation in 62 cases out of 2000 hysterosalpingograms.

Roland (1953) used Medopaque - H for hysterosalpingography in 50 cases of infertility, 25 cases showed obstruction or occlusion of tubes, they also reported pregnancies following hysterosalpingography.

Sobrero, A.J. et al (1961) reviewed 500 infertile women and subjected them to tubal insufflation and hysterosalpingography. They found 73% patients had primary infertility and 27% had secondary infertility. Their results of tubal insufflation were -

Unilateral patency	96 cases (19.2%)
Both tubes blocked	76 cases (15.2%)
Bilateral patency	328 cases (65.6%)

According to the results of HSG performed in 74 cases out of 500 cases. There were pathological findings on X-rays such as hydrosalpinx in 33 cases Submucous fibroid in 8 cases, bicornuate uterus in 4 cases, arcuate uterus in 2 cases, bifid uterus in 2 cases, Didelphic uterus in 1 case and cervical polyp in 1 cases.

Due to risk of pulmonary embolism after hysterosalpingography, Levinson (1963) advised to use water soluble contrast media.

Copenhaver and Wise (1963) used high speed hysterosalpingography utilising the polaroid rapid radiographic process. By this method an X-ray picture could be

obtained 15 seconds after the injection of the dye. The exposure of the medical personnel and patient, to radiation is reduced as much as to one thirteenth that resulting from normal HSG.

Finda (1964) observed that in a few cases of hydrosalpinx, repeated hysterosalpingography opens up tubes and conception occurs.

Gillespie (1965) stated that primary therapeutic function of hysterosalpingography is to clear the ovarian passage and if necessary, restore the patency of the tube at a period most favourable for conception. The contrast media has been suggested to have bacteriostatic action and stimulatory action on cilia of tubal epithelium. But the most accepted view is that the contrast medium causes mechanical clearing of the tubes by dislodging mucus plugs or breaking down the fine adhesions.

Catalano, D. (1966) tried Conray - 280 for the first time in hysterosalpingography procedure (60% aqueous solution of meglumine salt of iothamic acid with 2.8% iodine). He studied 100 cases and none of his patients complained of local pain. The only complaints were of heaviness and discomfort in lower abdomen which disappeared spontaneously within 10-15 minutes after the procedure.

Reed et al (1967) performed HSG with fluoroscopy and emphasized that this gave better results.

According to Norman, L. Avnet and Milton Elkin
(1967) -

- (a) approximately 2% of patients have same infection after hysterosalpingography which is well controlled by antibiotics. The cause is faulty cleaning of instruments, retrograde infection from the cervix and exacerbation of latent tubal infection.
- (b) Uterine rupture is most often associated with preliminary sounding.
- (c) Intramural infection by contrast media.
- (d) Intravasation of contrast.
- (e) Pain.

They reviewed that sterility may be related to tubal lesions as well as congenital anomalies of uterus. Tubal obstruction is most commonly due to salpingitis or pelvic inflammatory disease.

Ozaras (1968) analysed hysterosalpingography of 300 women having infertility surgery in hospital and found that the chances of post operative pregnancy was much better, in cases where tubal rugae were well visualised on the pre-operative roentgenogram.

Page (1968) presented 2 cases of infertility who revealed bilateral cornual block on HSG. Suspecting cornual spasm, he repeated the procedure one and half hour after giving vasodilan (vasodilator) and found the tubes patent bilaterally with peritoneal spill. He emphasized that if tubes be blocked at first investigation, the procedure should be repeated after giving a vasodilator.

Philip et al (1970) had studied the rugal pattern in 114 patients suffering from infertility and performed a number of surgical operations on fallopian tubes depending on the case and compared the result with those of Ozaras (1968). To their surprise, the result was very satisfactory and 70.3% of women becoming pregnant who had excellent rugal pattern whereas only 42.1% of the patients having poor rugal pattern and only 7.3% of those having no rugal markings became pregnant.

Gregary et al (1972) studied 3437 cases of infertility and found that 72.2% had primary infertility and 27.8% had secondary infertility. Observation of tubal blocks were more common in patients with secondary infertility (23.8%) and unilateral block 17.7%. He also observed that 36% cases had bilateral normal block.

Tiwari and Tiwari (1977) studied 77 cases of infertility by positive contrast hysterosalpingography using

Diagonal viscus and Conray 280. The authors observed tubal abnormalities in 50% cases, uterine and tubal abnormalities in 15.5% cases and uterine fibroid in 3.1%.

Nickerson, C.W. (1977) in his series of 190 primary infertility patients with patent fallopian tubes and no obvious causes for infertility, revealed 74.21% incidence of uterine anomalies.

Ansari, A.H. (1978) used Glucagon in an attempt to eliminate tubal spasm during hysterosalpingography because Glucagon has relaxing effect on the fallopian tubes.

Mukherjee et al (1978) subjected 45 patients of sterility and habitual abortion to hysterosalpingography using Conray 280. Except mild pain in 5 cases and headache in 2 cases no serious side effects were seen.

Jhaveri (1978) studied 100 cases of sterility by hysterosalpingography using CONRAY 280, out of which 89 were of primary sterility and 11 of secondary sterility. Seventeen of these 100 cases were reported to be having tubal abnormality, 70 were normal, 11 had uterine abnormality and 2 were of uterine fibroid. Peritoneal spillage was seen and 6 patients complained of mild to moderate pain.

According to Ansari, A.H. (1979) tubal factors are the most common cause of infertility contributing to 45% cases of infertility, being caused by -

1. Pelvic inflammatory disease
2. Pelvic endometriosis
3. Peritubal adhesions, previous pelvic surgery, previous appendisectomy.
4. Tubercular salpingitis
5. Extrauterine pregnancy
6. Intrauterine contraceptive devices.
7. Neoplasm.

Cervical factors contribute to 20% cases, ovarian factors 10%, uterine factors 10% and rest are contributed by vaginal factors.

Hornutz, R.G. et al (1979) contended that hysterosalpingography should be a preliminary procedure in every case and in many might be the only investigation of tubal patency required prior to surgery or conservative management. Of the 196 fallopian tubes studied by them only 6 showed cornual spasm and 8 had cornual occlusion.

Sharma et al (1979) in their study of 125 cases of HSG used Conray 280 in 113 cases and Diagonal viscous in 10 cases. 70 were of primary sterility and 40 of secondary infertility and 7 of repeated abortions. Bilateral peritoneal spill was seen in 27, 78.74% cases showed unilateral peritoneal spill and normal and patent fallopian

tubes. 20 patients had unilateral block, 21 had bilateral block, 6 had hydrosalpinx and beaded appearance was seen in 4 cases.

Cameron, D.D. et al (1979) described a simple method of hysterosalpingography using a Foley's catheter to inject contrast media. The technique allowed the patient to assume a more comfortable position during the study. The radiologist could perform the examination without the need of second physician to assist during spot filming and with no chance of metal artifacts during anatomy.

Jankharia, G.R. et al (1981) in their study of 105 patients - 55 of primary, 35 of secondary sterility and 15 others - reported that 13 patients had abnormal uterus and 92 had normal. The abnormal were further divided as bicornuate uterus 4, adenomyomatosis 1, fibroid uterus 2, hypoplastic regular 3 and hypoplastic irregular 3. Peritoneal spill was seen in 60 cases. Both the tubes were patent in 47 cases. One tube patent in 13 cases and both blocked in 42 cases. Abnormal appearances of the tubes unilaterally in 10 cases, bilateral hydrosalpinx in 13 and others like beading in 4 cases. 79 patients complained of mild pain, 19 had no pain, 7 patients suffered from moderate pain and vomiting, and 1 patient had pain in the right shoulder.

DeCherney and Michael R. Soules et al (1982) in their study established that oil based media were not as dangerous as sometimes indicated by proponents of water based media. Both types of contrast medium have evolved to the point of reliably providing information about uterine tubal anatomy, with minimal side effects. Therefore, useful diagnostic information could be consistently obtained with the use of both oil and water based media. Oil soluble contrast media might be superior to water soluble contrast media in regards to a therapeutic effect in relation to establishment of pregnancy.

Mark G. Schwabe et al (1983) emphasized to utilise HSG with oil contrast medium as a treatment modality for patients with the diagnosis of infertility of unknown cause. In his study, the cases with infertility of unknown cause had a significantly higher pregnancy rate after HSG with oil than after HSG with aqueous contrast medium.

Winfield, A.C. (1984) used Hexabrix (monocyclic) dimeric iodinated compound as a contrast material, on 52 patients. They found tubal disease in 14 patients, an incidence of 26%.

Potwal, Pushpa et al (1986) performed hysterosalpingography in 375 patients of infertility. They observed that cervical length was normal in 76% cases and

elongated in 24% of cases. 5 patients showed filling defect in cervix due to polyp. The cervix dilated in 4% of cases. 80% had normal sized, 4% had large sized uterus. All of these were because of myoma. The congenital hypoplasia was responsible for small size uterus in 12%, the remaining were due to tuberculosis. Tubal occlusion was seen in 60% and hydrosalpinx in 31% cases. Out of these, 44% had bilateral blockage. Tubal occlusion was located at cornual end (30%), fimbrial end was the next common site (20%) of block and isthmus block (6.7%). Free bilateral peritoneal spillage was seen in 43% cases while 13% showed unilateral spillage only. Complications were few and minor. HSG, thus can pinpoint the site and the type of pathology. Moreover, it has low incidence of false positive and false negative results.

Agarwal, G.N. et al (1988) tried hysterosalpingography in 2000 cases of both primary and secondary sterility. Abnormal findings were noted in 910 (45.5%) of these cases. Uterine anomalies were present in 48.5% and tubal pathology in 51.5%. Uterine malposition was commonest anomaly present in 13.4% cases followed by infection of female genital tract in 10.1%. 41.5% of 1160 cases of primary infertility showed anomaly. 46.6% of these had uterine pathology, while 53.4% had tubal pathology. Uterine malformation

was the commonest finding accounting for 17.5% cases. 52.7% of 910 cases of secondary sterility showed abnormality. 50.7% of these showed uterine pathology and 49.3% showed tubal pathology. Uterine malposition was the commonest finding with an incidence of 26%. Overall uterine malformation was seen in 4.35% of cases, the three most common malformations were arcuate uterus, uterus subseptus and unicornuate uterus.

Hysterosalpingography and tubal insufflation were the invasive type of procedures which were time consuming and cost wise were not economical and also the patient found them agonising. Though HSG was superior but it could give help in knowing the intramural condition of uterus and tubes only. The ovaries and other pelvic structures were totally excluded.

There was a constant search for a newer approach to the study of condition of the pelvic organs. This led to the evolution of 'Sonosalpingography' i.e. a technique using ultrasonography to detect fallopian tube patency by detecting presence of free fluid in pouch of Douglas following transcervical injection of a sterile fluid.

For the first time, according to the available literature, Richman, T.S. et al (1984) evolved this technique. They studied 35 infertile women and compared the

results with conventional hysterosalpingograms, which had been obtained simultaneously. Ultrasound demonstrated bilateral tubal occlusion with a sensitivity of 100% and showed tubal patency with a specificity of 96%. This technique eliminated unnecessary exposure of the female pelvis to ionizing radiation and avoided use of iodinated contrast material.

A pre-gynaecological scan of the pelvic organs was made to rule out presence of free fluid in cul-de-sac. Thus the condition of ovaries and adnexa could be assessed for any abnormality or presence of any lump in the pelvis. This rules out the detection of small hydrosalpinx and pelvic infections.

According to the study of Rasmussen, P. et al (1986) in which 24 infertile patients were assessed for fallopian tube patency by HSG and ultrasonography following transcervical injection of a sterile isotonic solution of sodium chloride. The presence of fluid in the posterior pouch, after the injection, was taken to indicate tubal patency. 87.5% (21 patients) patients showed tubal patency. Pitfalls consisted of fluid accumulation in periadenexal adhesions, edema in the bowel wall and spill of the injected saline into a large hydrosalpinx.

According to another study made by Randolph, J.F. Jr. et al (1986) comparison made between ultrasonography, hysterosalpingography and laparoscopy/hysteroscopy in the evaluation of uterine abnormalities together with tubal patency. They studied 61 women of the reproductive age group diagnosed as cases of infertility. They took surgical findings as the standard and recorded that the accuracy in demonstrating uterine abnormalities was :

	<u>Sensitivity</u>	<u>Specificity</u>
USG	98%	100%
HSG	98%	92%

and in demonstrating the presence of tubal patency :

	<u>Sensitivity</u>	<u>Specificity</u>
USG	100%	91%
HSG	96%	94%

but USG is not accurate for establishing which of the tube(s) is patent.

In 1989 Sharma, R.P. studied 30 cases of primary and secondary infertility. These cases had been diagnosed as having bilateral tubal block on HSG examination. Trans-cervically 50 ml of normal saline was injected through a Foley's Catheter. A routine pelvic gynaecological scan had been done before fluid injection to rule out presence of free fluid in pouch of Douglas. After fluid injection,

collection of fluid was seen, the presence of which indicated unilateral or bilateral tubal patency and absence of fluid indicated bilateral tubal block. He found that 80% of these patients showed tubal patency of USG examination, thus proving that USG technique is superior to HSG.

Besides using normal saline as the fluid medium for assessing tubal patency by sonosalpingography, Luo, L.L. (1990) used 1.5% hydrogen peroxide for transcervical injection. The study was made in 147 sterile women. These patients had already undergone HSG. 28.7% (42 cases) cases underwent laparoscopic examination of the tubes to assess the accuracy of the two diagnostic procedures. The correspondence rate between laparoscopic findings and ultrasonography was 88.0% and 60.0% with HSG. Animal experiments did not reveal any untoward effect of 1.5% hydrogen peroxide on the local tissues exposed to the solution except a transient increase of lymphocyte infiltration and exudate.

In 1991, Taori, M.C. et al published a paper on the comparative results of HSG, laparoscopic chromoperturbation and USG for fallopian tube patency of 50 patients. According to their study 34% patients showed bilateral block on HSG while only 23% on laparoscopy and the number increased to 36% on USG. 48% showed bilateral patency on HSG and 64% on laparoscopy and also USG. Unilateral tubal

patency could not be assessed by ultrasound technique but HSG showed 18% block and laparoscopy 8%. According to this study USG is economical and technically simple with less false negative results besides being non-invasive and so it is superior.

Advancing to the newer approach to assess the tubal patency by ultrasonography U. Deichert et al (1992) made additional use of pulsed wave Doppler. Their objective was to determine whether the additional use of pulsed wave Doppler can improve the tubal diagnosis reached with gray scale imaging in doubtful cases. 17 patients between ages 23 - 27 years, diagnosed as cases of sterility were studied. The contrast agent SM U 454 was administered transcervically during transvaginal gray scale and pulsed wave Doppler sonography. Hysterosalpingo-contrast-sonography by gray scale and by pulsed wave Doppler were performed. Follow up study was done by chromolaparoscopy or hysterosalpingography. The diagnostic efficacy of gray scale and pulsed wave Doppler were compared with each other and against a conventional control procedure. According to the study, the additional use of pulsed wave Doppler was recommendable as a supplement in suspected cases of tubal occlusion and in event of intratubal flow.

According to another study of Bonilla-Musoles, F. et al (1992) the value of hysterosalpingosonography (HSSG) as a diagnostic tool was evaluated in 76 patients and compared to hysteroscopic, laparoscopic and/or hysterosalpingographic (HSG) findings. Saline solution and Dextran 60 were used as distension media. The results indicated that HSSG had more sensitivity but less specificity than hysteroscopy or HSG in the diagnosis of uterine cavity pathology. Hysteroscopy seemed to be the best technique for the diagnosis of endometrial pathology and HSSG seemed to be the most effective in the study of the myometrium. According to the authors HSSG cannot be considered a reliable and accurate method for the diagnosis of tubal patency.

M A T E R I A L A N D M E T H O D S

M A T E R I A L S A N D M E T H O D

The present study was carried out in the Department of Obstetrics and Gynaecology and Department of Radiology, M.L.B. Medical College, Hospital, Jhansi over a period of one year.

SELECTION OF CASES

The cases were selected from the patients reporting in the out patients department of Department of Obstetrics and Gynaecology and were diagnosed as cases of sterility, either primary or secondary.

A detailed history regarding the age of patient, presenting complaints, duration of married life and stay with husband, menstrual history, obstetrical history, past illness and family history was taken.

In cases of primary infertility details of menstrual history were noted in view of any organic cause of the uterine or ovarian origin leading to infertility. The husband was also investigated for any abnormal findings in the semenogram.

In patients of secondary infertility details of the previous pregnancies were recorded with special emphasis on the outcome of last pregnancy and the periperal period.

These patients were then subjected to thorough clinical examination.

The patients in whom clinical examination and history and husband's semenogram revealed no positive findings were then subjected to the test for assessment of tubal functions. These tests include hysterosalpingography in the pre-ovulatory period i.e. between 6th- 10th day of the menstrual cycle and simultaneously followed by 'sonosalpingography' or assessment of tubal patency by ultrasonography.

The results of the two procedures were compared with special reference to patient compliance and problems encountered during each procedure.

MATERIAL USED

1. X-ray films 8x10" size
2. Contrast media (Conray-280)
3. Sim's speculum, Volzsellum, anterior vaginal wall retractor, uterine sound, hysterosalpingography canula, Leech Wilkinson type, 20 ml syringe, Foley's catheter No. 14/16/18.
4. Normal saline
5. X-ray machine, Developer and fixer solution
6. A real time ultrasound scan

METHOD

For the assessment of tubal functions the patient was subjected to hysterosalpingography and sonosalpingography in the pre-ovulatory period i.e. from 6th - 10th day of the menstrual cycle.

A pre-medication was given with an antispasmodic (Buscopan or Avafortan) 15-20 minutes prior to the procedure. In patients who were too apprehensive to undergo the procedure a sedative like Diazepam was given. The patient was asked to evacuate the bladder and was made to lie on the examination table in the lithotomy position. A bimanual examination was again done to assess the size and position of uterus and the condition of adnexa. Sim's speculum was introduced and anterior vaginal wall retracted with an anterior vaginal wall retractor to visualise the cervix. Velsellum was then used to catch hold of anterior lip of cervix and a uterine sound passed to know the length and direction of uterus. If the cervical canal was found to be stenosed, cervical dilators (Hegar's type) were used to dilate the cervix. Then the screw type Leech Wilkinsons cannula was introduced into the cervix. Care was taken that the knob of the canula fitted against the external os tightly so as to prevent any leakage of the dye. A 20 cc sterile syringe was loaded with 10-12 ml dye (Conxray-280) and attached

to the canula after removing the stellate of the canula. It was assured that there was no leakage of the dye. Now the speculum and the anterior vaginal wall retractor were removed carefully taking care not to displace the volsellum and the canula. Patient's knees were extended and radiographic films were taken.

- (1) Immediately after injection of dye.
- (2) After 5-7 minutes of the injection of dye.

Whole of the procedure was carried out under aseptic conditions.

One day after the hysterosalpingography, the patient was called for sonosalpingography with full bladder. A pre-scan was done to assess the condition of uterus, adnexa and pelvic organs and to rule out presence of fluid in pouch of Douglas. The patient was put in lithotomy position, cervix visualised and caught by volsellum (anterior lip) and Foley's catheter introduced. It was inflated by 2-3 cc of normal saline. Speculum and volsellum were removed. Now 50 ml of normal saline was injected through this catheter into the uterine cavity and half an hour later another USG scan was done to see for distension of uterine cavity or presence/absence of free fluid in pouch of Douglas.

Whole of this procedure too was carried out under aseptic conditions.

The sonography was performed with a real time sector sonographic scan.

When the two procedures were being carried, patients were noted in relation to the amount of discomfort felt during the two procedures and any untowards findings during the procedures. Later on the results were compared.

O B S E R V A T I O N S

OBSERVATIONS

The present study is based on the study made on 42 patients of infertility both primary and secondary who attended the out patient department of the Department of Obstetrics and Gynaecology, M.L.S. Medical College Hospital, Jhansi.

Out of the 42 patients studied, 26 were of primary infertility and 16 were of secondary infertility.

TABLE - I

Distribution of cases according to type of infertility

Sl. No.	Type of infertility	No. of cases	Percentage (%)
1.	Primary infertility	26	61.9%
2.	Secondary infertility	16	38.1%
Total		42	

At the time of reporting, a detailed history of each patient was taken with reference to her age, menstrual history, duration of married life, duration of stay with husband, obstetrical history.

TABLE - II

Distribution of cases according to age

Sl. No.	Age groups (In years)	No. of cases	Percentage (%)
1.	19 - 21	2	4.8
2.	22 - 24	4	9.5
3.	25 - 27	22	52.3
4.	28 - 30	10	23.8
5.	31 - 33	2	4.8
6.	34 - 36	0	0
7.	37 - 39	0	0
8.	40 - 42	2	4.8
Total		42	

As seen from the above Table II maximum patients i.e. 22 (52.4%) belonged to the age group of 25 - 27 years, 23.8% i.e. 10 patients belonged to the age group of 28- 30 years. Only 2 cases each i.e. 4.8% patients were seen in the extremes of the reproductive age group i.e. 19- 21 years and 40-42 years. There is no patient reporting in the age group between 34 - 39 years.

TABLE - III

Showing duration of married life for seeking investigations for primary infertility.

Sl. No.	Duration of married life	No. of cases	Percentage (%)
1.	2 years	0	0
2.	4 years	10	38.46
3.	6 years	4	15.39
4.	8 years	6	23.07
5.	10 years	4	15.39
6.	7 10 years	2	7.69
Total		26	

Thus, we see from the above distribution that maximum cases were in the duration of 4 years of their married life to seek the investigations for primary infertility and only 2 cases reported at a very late period i.e. of more than 10 years duration of their married life.

TABLE - IV

Showing duration from last child birth and seeking investigation for secondary infertility.

Sl. No.	Period from last pregnancy	No. of cases	Percentage (%)
1.	Upto 2 years	4	25.0
2.	Upto 4 years	6	27.5
3.	Upto 8 years	2	12.5
4.	Upto 10 years	4	25.0
Total		16	

TABLE - V

Showing relationship between previous pregnancies and secondary infertility.

Sl. No.	No. of previous pregnancies	No. of cases	Percentage (%)
1.	1	10	62.5
2.	2	4	25.0
3.	3	0	0
4.	4	2	12.5
Total		16	

Tables IV and V show that though the maximum number of patients (27.5%) of secondary infertility have come to seek treatment after 3 - 4 years of last pregnancy and the problem of infertility has mainly arisen after the first pregnancy in 62.5% patients.

Only 2 patients of secondary infertility had come after 3 or more pregnancies. Out of these one patient had history of repeated abortions (all 4 abortions). But no pathology was identifiable in the cervix, uterus and the fallopian tubes at the time of investigation.

TABLE - VI

Showing comparison of tubal patency by HSG and USG.

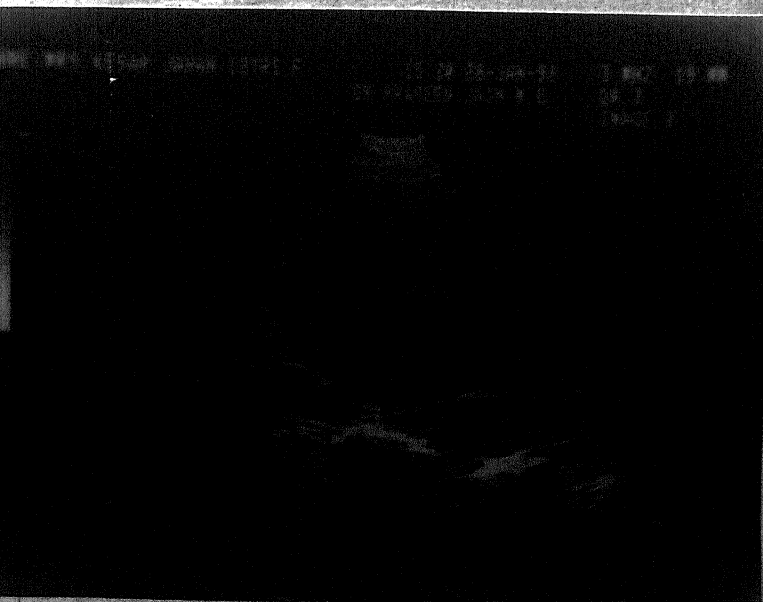
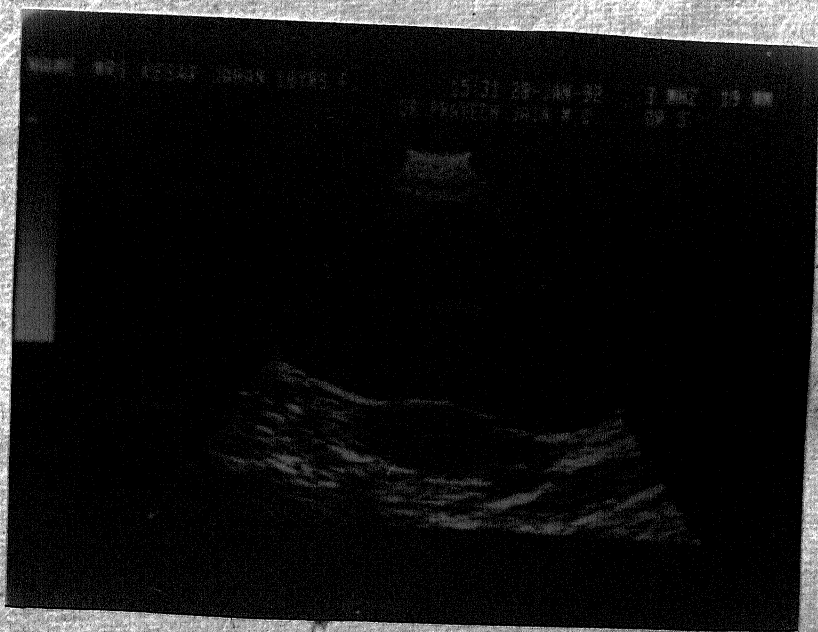
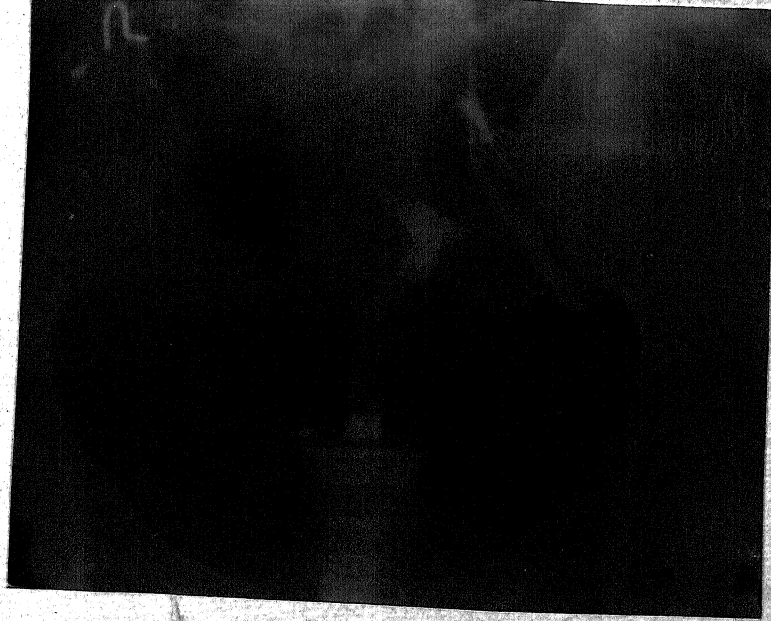
Sl. No.	Results	HSG	USG
1.	Bilateral patency	14 (33.33%)	32 (76.19%) (Patency only assessed) It could not be assessed whether one or both tubes were patent.
2.	Unilateral patency	10 (23.81%)	
3.	Bilateral block	18 (42.86%)	10 (23.81%)

As seen from Table VI, 14 cases showed bilateral patency and 10 unilateral patency on HSG. While 32 cases showed patency on ultrasonography. On USG, it could not be specified whether one tube was patent or both the tubes were patent.

18 cases showed bilateral block on HSG while only 10 cases showed bilateral block on ultrasonography. Thus, there were eight cases which showed blocked tubes on the hysterosalpingography but showed tubal patency on ultrasonography. In one of the case of bilateral block on HSG and also USG, the patient had bicornuate uterus, and another patient had massive hydrosalpinx of the right sided fallopian tube.

PLATE-I

Shows photographs of HSG and USG of a patient of primary sterility in whom the HSG showed bilaterally patent tubes with peritoneal spill and the USG confirmed this by presence of free fluid in cul-de-sac - following normal saline injection. The ovaries and uterus were normal in size. The findings were clinically consistent and also the HSG and USG findings were consistent.



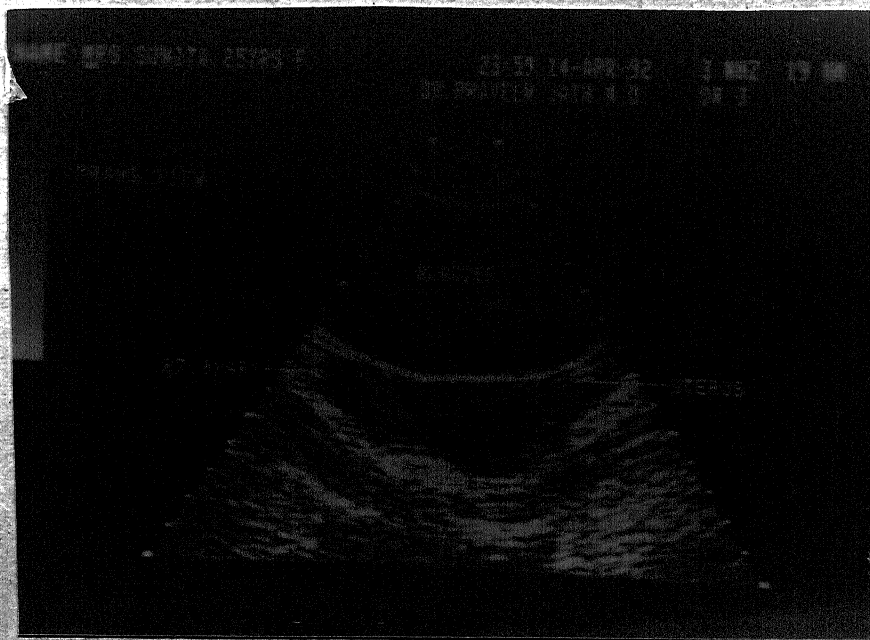
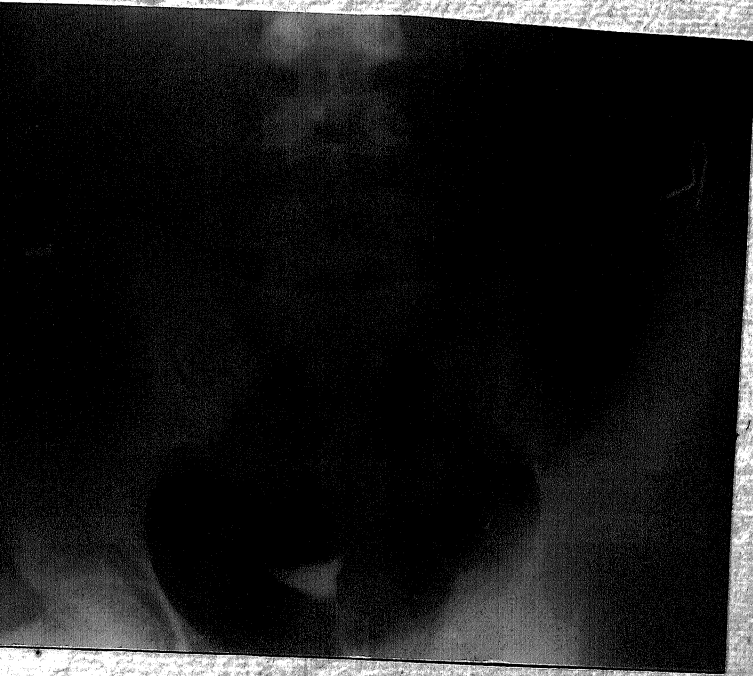
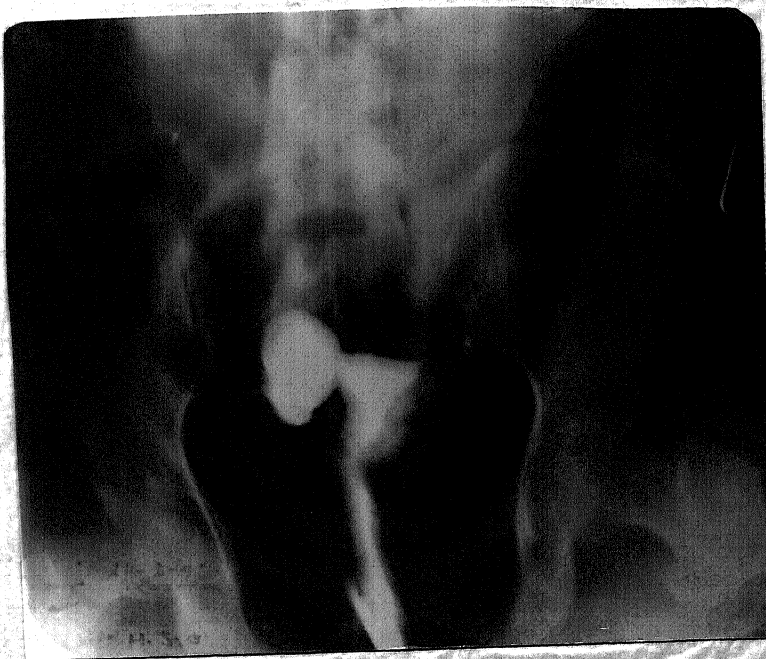


PLATE -III

This shows the comparative results of HSG and USG in a patient of secondary sterility. The HSG shows bilateral block of the fallopian tubes at their fimbrial ends. The uterine cavity and rest of the tubes are normal in outline. On USG evaluation also there was no abnormality of the uterine cavity and ovaries were normal. After normal saline injection, no free fluid could be detected in the pouch of Douglas indicating bilateral blocked tubes.

The findings of both hysterosalpingography and ultrasonography were consistent with each other.







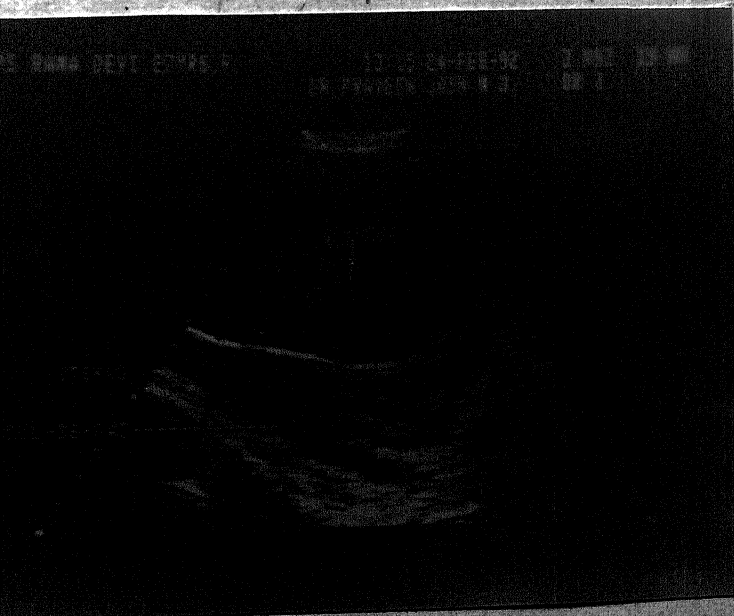


PLATE-VII

This again shows HSG and USG of a patient of primary sterility. Both HSG and USG indicate patency of the tubes. Uterus and ovaries were found to be normal in the pre-fluid injection scan of the pelvis. Though, USG could not specify if one tube was patent or both were patent.

The findings of hysterosalpingography and ultrasonography were in accordance with each other.

The amount of discomfort experienced by the patient was almost the same during both the procedures.

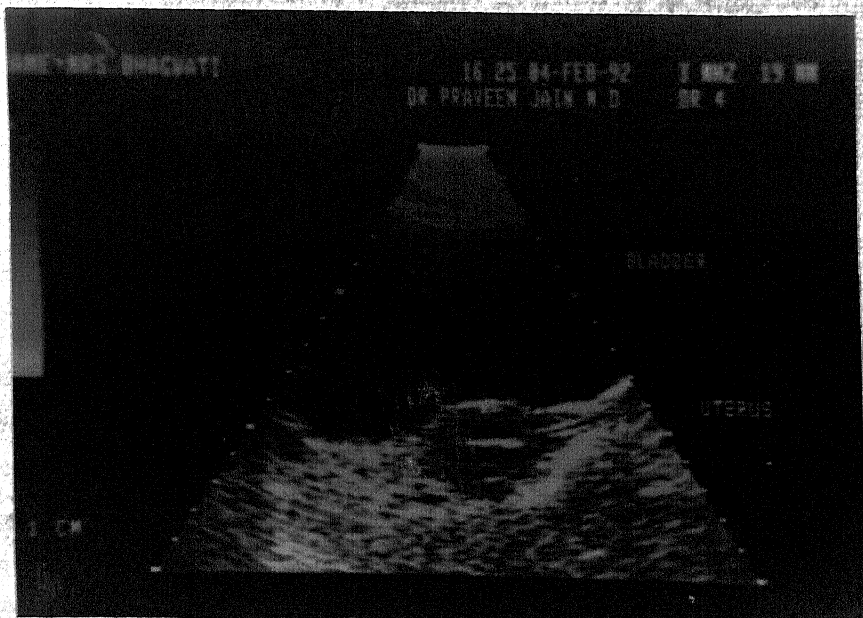
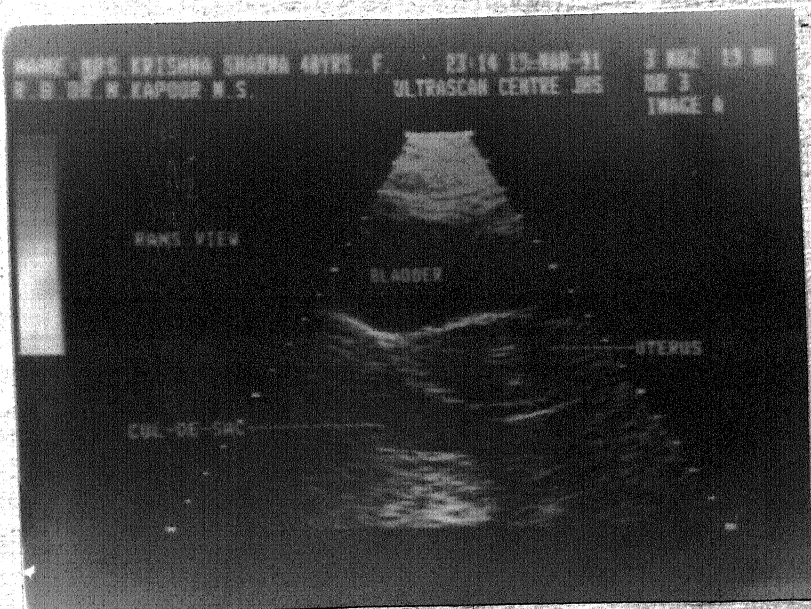


PLATE -VIII

This patient of primary sterility showed bilateral block of the fallopian tubes on HSG. The block was near the cornual end. On USG the uterus was normal in size and ovaries were also normal and the tubes were also found to be blocked.

The hysterosalpingographic and sonosalpingographic findings were in accordance with each other.

During USG, very small amount of fluid could only be pushed transcervically, the patient complaining of severe pain in the lower abdomen, which was relieved as soon as the injection of fluid was stopped. This subjective finding indirectly confirmed bilaterally block of the tubes.



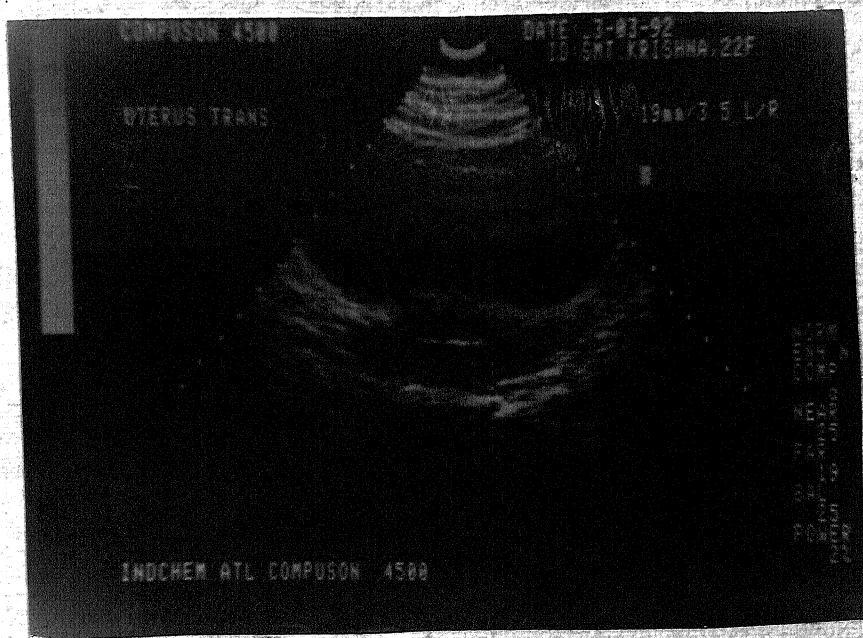


PLATE -X

This patient of primary sterility showed block of left tube on HSG. The block was near the fimbrial end. The right tube was patent.

On USG, the uterus and ovaries were normal and free fluid was detected in pouch of Douglas, indicating patency of tube(s).

The side effects were mainly noticed in the form of pain in lower abdomen during the injection of dye for HSG and normal saline for USG. The pain after dye injection was more discomforting to the patient as 70% patients had to take an analgesic even on the day following after procedure. While the patients undergoing USG did not feel pain once the normal saline had been injected. And after completion of the USG scan, as soon as they could evacuate their bladder, they did not feel any discomfort. No analgesic was required in the immediate post-procedure (USG) period even in a single patient. Only one case of primary infertility developed vomittings immediately after the USG which were not severe and were controlled immediately with rest and assurance. The patient had been too apprehensive before the test and had come to seek the investigations after about 8 years of her marriage. No other untoward side effects were seen in any other patients.

D I S C U S S I O N

D I S C U S S I O N

Tubal factors account for 40-45% female infertility (Ansari, A.H., 1979) out of the total infertile population. Thus, one of the major determinants to be made in every infertility evaluation is whether or not the patient seeking investigations for infertility and subfertility has patent fallopian tube(s).

The present study was thus undertaken to evaluate comparatively, the two main diagnostic methods available at present i.e. hysterosalpingography - an invasive method and sonosalpingography (USG) - a non invasive method in terms of efficacy and patient compliance.

42 patients, both of primary and secondary infertility were studied by both the methods and the results compared. 61.9% patients were of primary sterility and 38.1% of secondary infertility. These observations are closely consistent with those of Rutherford et al (1949) - primary infertility 62.8% and secondary infertility 37.2%.

In the present study we observed that maximum percentage of cases reported for infertility were between the ages of 25-30 years (76.2%) while very few cases reported after 35 years (4.8%). Most of the patients of primary infertility came to seek investigations within 4 years of their

married life (38.46%) while only 7.69% cases reported after a period of 10 years.

In cases of secondary sterility we observed that maximum number of cases (37.5%) came for investigations within 4 years of last child birth and maximum cases of secondary infertility reported after birth of single child only (62.5%). Two cases (12.5%) of secondary infertility reported who had previous history of recurrent abortions.

According to the present study of 42 cases. 18 cases (42.86%) showed bilaterally blocked tubes on HSG while only 10 cases (23.81%) showed bilaterally blocked tubes on sonosalpingography (USG). Thus, there were 8 such cases (19.47%) who showed patent tubes on USG but bilaterally blocked tubes on HSG.

Unilateral tube patency could not be assessed by USG but HSG revealed this in 10 cases (23.81%). Bilateral tubal patency as assessed by HSG was found in 14 cases (33.33%).

Patency, as assessed by USG (not assessing unilateral or bilateral was in 32 cases (76.19%).

These findings are in close proximation to the study of Richman, T.S. et al (1984) who studied 35 patients and found :-

	<u>HSG</u>	<u>USG</u>
Bilateral patency	25 (72.43%)	24 (68.57%)
Bilateral blocked tubes	9 (25.71%)	9 (25.71%)

False positive was reported in only one case result (2.86%).

According to this study, HSG was taken as the standard technique to evaluate sonosalpingography results. The authors found that ultrasound demonstrated bilateral tubal occlusion with a sensitivity of 100% and showed tubal patency with a specificity of 96%.

In the present study, we came across one patient of gross hydrosalpinx of the right tube with bilateral tubal block on HSG. On USG patency of the tubes was observed. Similar pit falls were observed in a study of 24 patients conducted by Rasmussen P et al (1986). Their observations showed tubal patency (both by HSG and USG in 21 patients (87.5%). In rest of the three patients (12.5%), they found either fluid accumulation in periautaxal adhesions, edema of bowel wall or spill of the injected saline into a large hydrosalpinx.

In our study, we observed that HSG was accurate in locating the site and side of tubal occlusion but gave false negative results was in 8 patients. This was due to reflex spasm and bilateral occlusion of the tubes seen.

Whereas, the USG was more sensitive in detecting patency of tubes but was not specific in determining the site and side of tubal occlusion.

In a study made by Randolph JF Jr, et al (1986) surgical procedures - laparoscopy/hysteroscopy - were taken as the standard in 61 patients of infertility and then hysterosalpingography and ultrasonography were performed. According to them USG is 100% sensitive (HSG sensitivity is 96%) but only 91% specific (HSG specificity is 94%). They concluded that USG is better for establishing tubal patency but not accurate for establishing which of the tubes is patent.

If we take surgical findings as the standard technique we can also ascertain the sensitivity and specificity of the two procedures i.e. HSG and USG and can compare the results of the two procedures.

In the present study, we observed false negative results on HSG in 8 patients (44.44%). Bilateral tubal block was found in 18 patients on HSG while only 10 patients (55.56%) showed bilateral block on USG. Sharma R.P. (1989) studied 30 patients of bilateral tubal block on HSG. 24 (80%) of these patients showed patent tube(s) on USG while only 6 patients (20%) showed blocked tubes. Thus, according to this study also USG is superior to HSG in determining the patency of

the tubes. While according to the study made by Taori M C, et al (1992), there was no significant difference between HSG and USG findings. They found bilateral block on HSG in 34% patients and on USG in 36% patients in a study of 50 cases. But advocate that USG is superior to HSG and laparoscopy in that USG is :-

- Non-invasive
- Economical
- Technically simple with less false negative results.
- Can also demonstrate any obvious uterine or ovarian factor in the same sitting.

We observed in our study that during USG examination, that too during fluid injection, only 50% patients complained of severe pain. Similar problem was encountered almost with all patients in the study made by Bonilla Musoles P, et al (1992). In our study, that patients complaining of pain were mainly those who showed blocked tubes. The pain subsided after the procedure without any treatment. While the pain experienced by patients during dye installation during HSG required anti-spasmodic analgesics.

C O N C L U S I O N S

C O N C L U S I O N

In the present study carried out on patients of primary or secondary infertility in the Department of Obstetrics and Gynaecology, M.L.B. Medical College, Jhansi, we concluded that :-

- (1) Tubal factor is an important cause of infertility.
- (2) Tubal patency can be performed by HSG and USG and the results are comparable.
- (3) USG is a recent technique and it does not determine the site and side of block, but it does not matter much as ovum is known to be released alternatively from each side.
- (4) Sonosalpingography may also be used to assess tubal status following microsurgery for reanastomosis and is clearly indicated in patients with a history of reactions to iodinated contrast material.

Advantages of USG as compared to HSG :

1. USG is superior to HSG as it is non-invasive, economical and technically simple with less false negative results.

2. Can be carried out on an out patient basis without anaesthesia.
3. There is absence of exposure to ionising radiation or risk of contrast sensitivity (anaphylaxis) in the patient.
4. Visualisation of uterine and extrauterine pathology.
5. Identification of a follicle can be made.
6. Potentially safe and convenient.

Disadvantages :

1. World wide experience is too scarce.
 2. Tubal patency can not be diagnosed accurately.
 3. It can not be used to define tubal anatomic structure.
 4. Large volume of fluid is needed for assessing tubal patency and so more patient discomfort during injection of the fluid transcervically.
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B I B L I O G R A P H Y

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WORKING PROFORMA

WORKING PROFORMA

WORKING PROFORMA

Case No. _____

MRD/OPD No. _____

Dated : _____

Name :

Husband's name :

Age/Sex :

Address :

Marital history : a. Married life :
b. Duration of stay
with husband

Obstetrical History :

- a. Parity
- b. Abortions
- c. Last pregnancy
- d. Outcome of last pregnancy
- e. Puerperium

Menstrual History :

- a. Menarche
- b. Cycles
- c. Flow
- d. Dysmenorrhoea
- e. L.M.P.

History of Previous Treatment :

- a. Drugs
- b. Surgery
- c/o (a) Discharge P/V
(b) Dyspareunia

O/E P/V - Uterus
 - Cervix
 - Vagina
 - Any other specifications

Investigations :

Husband
 A,B,O, Rh.
 V.D.R.L.
 Seminogram

Wife
 A,B,O, Rh.
 V.D.R.L.
 P.C.T. -

E.B.
 H.S.G.
 U.S.G.

Date	Day from LMP	Drugs used	Result	Problem encoun- tered	Any other findings during investi- gation
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H.S.G.

U.S.G.